MASS. CA 1.2:V 65

UMASS/AMHERST
312066 0308 0574 5

Commonwealth of Massachusetts

Office of Consumer Affairs and Business Regulation

The Viability and Impact of Establishing a Minimum Purchase Requirement in Massachusetts for Existing Renewable Energy

A Study to the Joint Committee on Energy

October 2003

GOVERMENT DOCUMENT
COLLECTION
MAY 07 2004
University of Massachusetts
Depository Copy

Mitt Romney
Governor

Beth Lindstrom
Director, Consumer Affairs and Business Regulation

Kerry Healey
Lt. Governor

David L. O'Connor
Commissioner, Division of Energy Resources

I. OVERVIEW

Summary

The Division of Energy Resources (DOER) is pleased to present this analysis of the viability and impact of establishing a minimum purchase requirement for existing renewable energy, per order of the Joint Committee on Energy. A minimum purchasing requirement would oblige electricity suppliers to Massachusetts customers to include generation from existing renewable energy. The requirement would be set at the percentage of existing renewable energy supplied in New England in 1997. DOER spent considerable time collecting and analyzing all available renewable supply data in order to establish a minimum purchase requirement for benchmarking purposes and to examine the recent performance of this benchmark.

Generally, the examination shows no reduction in the existing renewable energy supply in New England and notes the current markets for existing renewable energy in Maine and Connecticut. DOER determines that adding a similar requirement in Massachusetts will not provide significant market benefit to existing renewables, and will add undue administrative and other costs to Massachusetts customers. DOER recommends that a minimum purchase requirement in Massachusetts not be pursued.

Structure of Study

The study is structured in the following manner.

1. Calculation of the percentage of existing renewable electricity sales to New England end-use customers to total sales to New England's end-use customers in 1997. This percentage is referred to as the "New England Baseline Percentage".
2. Determination of existing renewable energy generation in New England in 2002 and analysis of supply trends by technology between 1997 and 2002.
3. Evaluation of current demands for the attributes of existing renewable energy in New England within the Maine and Connecticut RPS programs and the green power market.
4. Analysis of the viability and impact of establishing a minimum purchase requirement in Massachusetts.

II. CALCULATION OF 1997 MINIMUM PURCHASE REQUIREMENT

The following equation was used to calculate the Baseline Percentage for New England on which a minimum purchase requirement would be based. The baseline percentage is developed using the retail sales and supply resources of New England investor-owned utilities.

$$\text{Baseline Percentage} = \frac{\text{1997 New England Renewable Energy Generation – Line Losses}}{\text{1997 Retail Sales to New England End-Users}} \times 100$$

The numerator is the existing renewable energy purchased from retail suppliers by New England end-users during the 1997 base period. The total amount of existing renewable energy generated for New England retail customers is 7,652 GWh. The amount is reduced from 8,241 GWh to reflect transmission and distribution losses.

The denominator of the baseline percentage is the total retail sales to New England end-users during the 1997 based period as reported by each utility of every New England state. The total amount of electricity sold to New England end users in 1997 is 96,088 GWh.

These data are summarized in Table 1, which shows the results of DOER's calculation of the 1997 New England Baseline Percentage, and the similar calculation that was done for Massachusetts in a previous study[1]. The calculated percentage of 8.0% represents the fraction for New England end-use sales derived from existing renewable energy in 1997; and 7.8% represents the percentage of Massachusetts end-use sales in 1997 derived from existing renewable energy.

Table 1. Summary of 1997 Baseline Percentage Calculation

1997 Baseline Calculation Summary Section	New England Eligible Renewables	MA Eligible Renewables
Renewable Generation (MWh)	8,240,712	3,453,499
Less: Loss (MWh)	589,090	238,008
Equals: Numerator	7,651,622	3,215,491
Retail Sales (MWh)	96,087,852	41,294,095
Baseline Percentage	**8.0%**	**7.8%**

Data Source: FERC Form 1 pp.: 326-327; pp.: 310-311; pp: 401; 2000 Study. See Appendix A for additional detail.

Existing Renewable Eligibility & Supply

The New England Baseline Percentage is calculated based upon the definition of existing renewable energy as stated in the Massachusetts Electric Utility Restructuring Act. The "Act" defines existing renewable energy technologies to include hydro, wind, solar, landfill gas, municipal solid waste, and biomass commercialized before December 31, 1997. Table 2 lists all the technologies that are eligible as existing renewable energy and provides some indication of their significance in the New England supply.

[1] The study " Massachusetts Renewable Portfolio Standard - Report on Sales from Existing Renewable Energy Generation Sources" which will hereby be referred to as the "2000 Study" was conducted for the RPS Stakeholder process in May 2000.

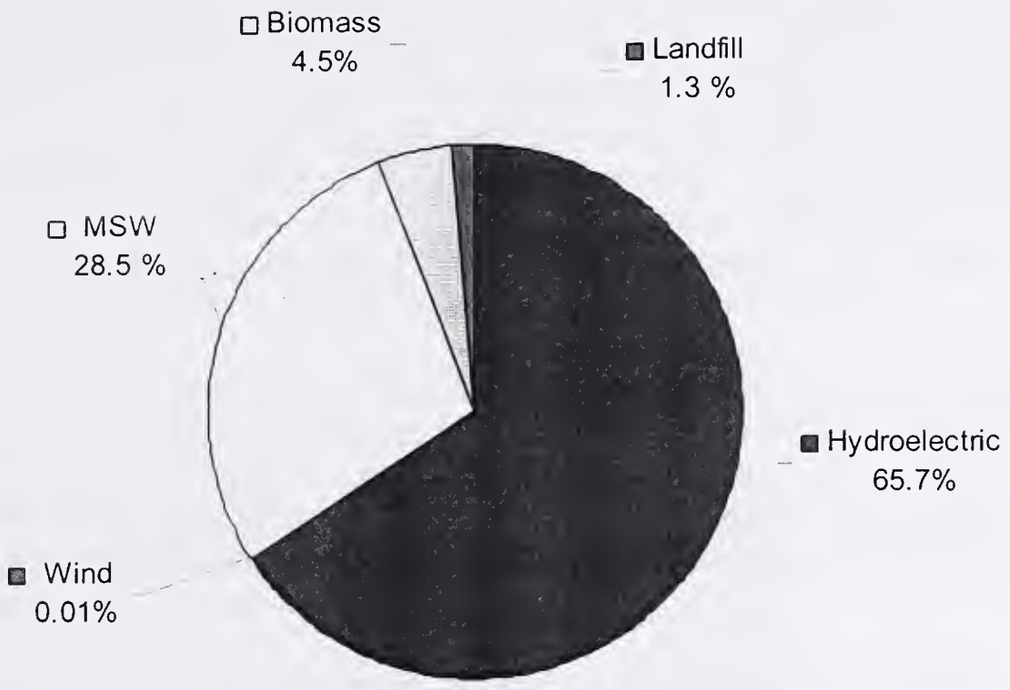
Table 2. Existing Renewable Supply: Technology Eligibility in New England

Technology	Eligibility	Amount Available
Hydroelectric	Eligible, excluding the Hydro Quebec Firm Energy Contract (FEC)[2]	Highly significant, especially in states like RI, NH and ME.
Biomass	Eligible	Significant
MSW	Eligible	Highly significant
Landfill gas	Eligible	Somewhat significant
Wind	Eligible	Very little
Solar	Eligible	Insignificant
Fuel Cells	Eligible	None
Ocean Wave/Tidal	Eligible	None

Unlike the Massachusetts Renewable Energy Portfolio Standard (RPS) market established for new renewable energy, the Act does not establish a market premium for existing renewable energy. Eligibility of existing renewable energy does not specify a size restriction on hydropower eligibility nor a low-emissions requirement for biomass. Thus, all technologies are qualified under the definition of existing renewable energy.

Figure 1 shows the percentage of existing renewable energy supply in 1997 by technology. However, due to limitations of the FERC Form 1 data to definitively establish the generation source of electricity supply, the allocation of the total existing renewable energy to the various technologies is not possible. DOER is confident, however, that the total aggregate supply of existing renewable energy is accurately evaluated. Figure 1 is offered to provide the general understanding that hydroelectric and MSW facilities account for the large percentage of the renewable supply, with important contribution from biomass as well.

[2] The Hydro Quebec FEC was excluded due to the fact that it was not renewed and expired in September 2001.



Source: FERC Form 1. See Appendix A for more detailed data.

Figure 1. Existing Renewable Energy Supply in New England by Technology, 1997

Data Sources and Analysis

The data for the Baseline Percentage were taken from FERC Form 1 for 1997[3],. The data does not include municipalities and cooperative utilities. Appendix B presents the complete list of total retail sales by the major utilities in each state. As discussed above, the total retail electricity sales of investor-owned utilities was used as the denominator for the 1997 New England baseline percentage.

The numerator of the Baseline Percentage is the renewable electricity generation owned or purchased by retail suppliers in New England, reduced by transmission and distribution line losses to determine the supply to customers. All data are determined at the consumption level and not at the generation level.

[3] For the 1997 baseline calculation, only the largest utilities were used, resulting in sample coverage of 88% of total New England sales.

III. ANALYSIS OF 2002 EXISTING RENEWABLE ENERGY SUPPLY

Data Sources and Analysis

The New England Generation Information System (NE-GIS)[4] offers readily available and practical electricity generation data starting in 2002. DOER used the 2002 NE-GIS data to determine the current generation of all generators in New England, and to determine the generation that came from existing (and new) renewable energy facilities. The ratio of these two figures provides the 2002 percentage of renewable energy supplied to New England customers. In this calculation the data are not adjusted for line losses because the same percentage line loss would impact both the total generation and renewable generation (numerator and denominator) before serving end-use customers.

The 2002 NE-GIS data is provided in Table 3. The total electricity generation in New England in 2002 based on the NE-GIS data is 118,926 GWh. As shown in the table, the total renewable energy generation is reduced by the amount of renewable energy generation captured in the Massachusetts RPS program (only effective RPS in New England for new renewables in 2002). Therefore, the total 2002 generation of existing renewable energy is 10,062 GWh.

Table 3 breaks down the renewable energy generation by technology. The 2002 percentage of supply that comes from existing renewable energy generation is 8.5%, an increase over the 1997 Baseline Percentage of 8.0%.

Table 3. 2002 Existing Renewable Energy Supply

2002	Existing and New Renewables (MWh)	Existing and New RE (%)	New RE to RPS (MWh)	Net Existing Renewable (MWh)	Net Existing (in %)
Hydro	5,085,899	4.3%	not applicable	5,085,899	4.3%
Wind	12,938	0.0%	1,396	11,542	0.0%
Solar	65	0.0%	15	50	0.0%
MSW	3,475,834	2.9%	not applicable	3,475,834	2.9%
LFG	293,576	0.2%	129,502	164,074	0.1%
Biomass(Wood)	842,937	0.7%	107,993	734,944	0.6%
Other Biomass	608,429	0.5%	18,695	589,734	0.5%
Total	10,319,678	8.7%	257,601	10,062,077	8.5%

Note: Percentage is based on the Total # of Certificates.

Source: 2002 NEPOOL-GIS

[4] NE-GIS is operated by ISO-New England. see: www.nepoolgis.com

Comparison of Existing Renewable Energy Supplies in 1997 and 2002

The percentage of New England electricity supply generated by existing renewable energy has risen from 8.0% to 8.5% between 1997 and 2002. The data broken down by renewable energy technology is shown in Figure 2. The data show that existing renewable energy supply has not diminished over this time period. The data suggest that output from the MSW and biomass plants have increased, while the hydroelectric generation has fallen. (Due to limitations discussed earlier in the 1997 data to allocate across renewable energy technologies, this these trends should not be emphasized.)

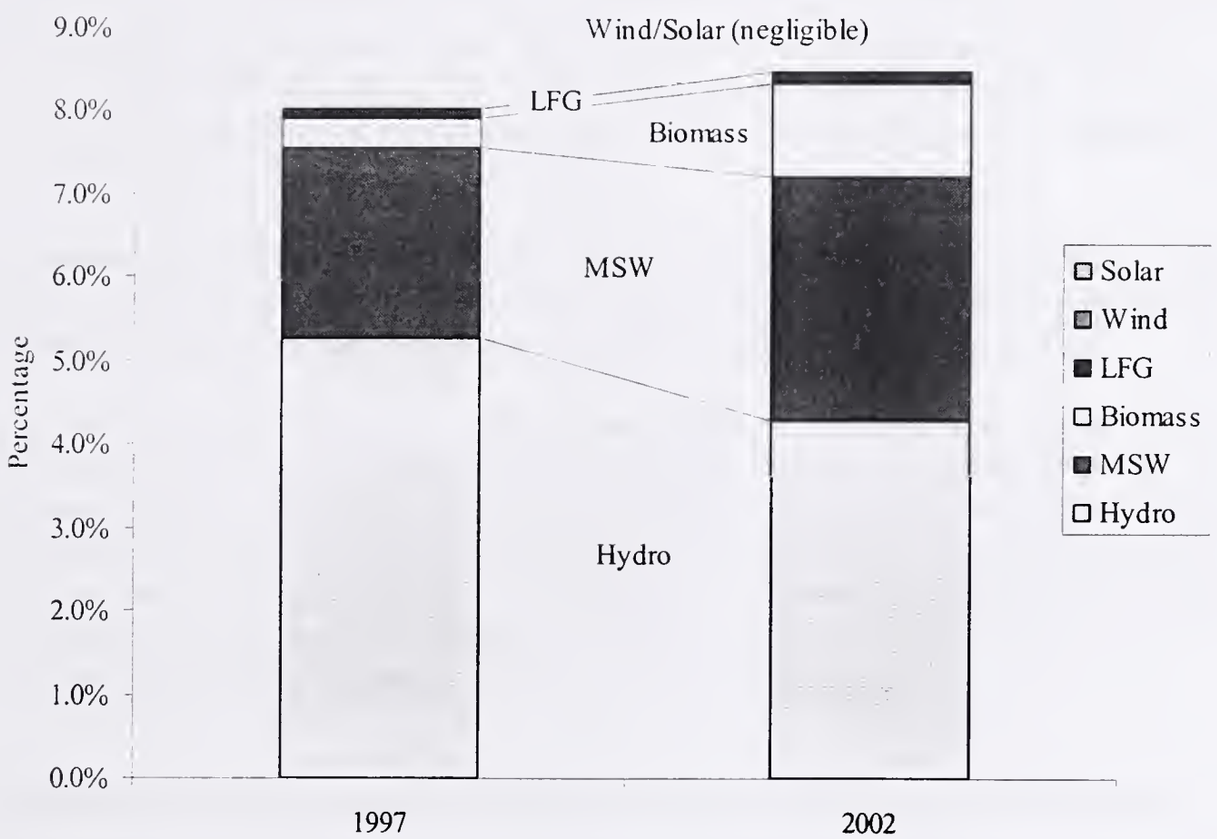


Figure 2. Comparison of 1997 and 2002 Existing Renewable Energy Supply in New England

IV. ANALYSIS OF A MINIMUM PURCHASE REQUIREMENT FOR MASSACHUSETTS

Summary Analysis – Existing Renewable Energy Trend 1997-2002[5]

The 1997 baseline percentage of renewable energy supply in New England was determined to be 8.0%. DOER has been asked to analyze the viability and impact of setting a minimum purchase requirement on Massachusetts electricity suppliers equal to this baseline level of 8.0%.

Based on the analysis of the 2002 data from the New England Generation Information System, the percentage of the total supply that comes from renewable energy in New England is 8.7%, representing about 10,320 GWh. The new renewable energy generation that is eligible and has already been reported for 2002 Early Compliance for the Massachusetts RPS program is 258 GWh. If this amount is removed from the total renewable supply, then the existing renewable supply in New England is determined to be 10,062 GWh, or 8.5% of the total supply.

In summary, DOER determines that the supply of existing renewable energy in New England has increased from 8,241 GWh in 1997 to 10,062 GWh in 2002, and from accounting for 8.0% of the total supply in 1997 to 8.5% of the supply in 2002.

The existing renewable energy supply in New England is dominated by contributions from the Municipal Solid Waste (or Trash-to-Energy) facilities, hydroelectric and biomass. DOER notes that the MSW plants in New England have been able to sustain their operation as power generators without a role in the Massachusetts RPS program. DOER is aware of some shut down of hydroelectric facilities in northern New England as power purchase agreements have expired. DOER expects reduction of hydroelectric generation in the future as more facilities reach the expiration.

Eligibility of Existing Renewable Energy for RPS and Green Product Markets

As part of the ISO-NE control area, existing renewable energy generators are offered a number of options for selling Renewable Energy Certificates (RECs) that represent the premium attributes of their generation. Currently, Massachusetts, Maine, and Connecticut have RPS programs, and "green" product offerings on a retail level are emerging as well. DOER specifically notes the importance for the New England REC market of the re-designed Connecticut RPS program and the National Grid GreenUp program. These programs have specific eligibility criteria for renewable generation, which are summarized below for the significant existing renewable energy technologies.

---

[5] For this analysis, DOER depended on the best data reasonable available. The data for 1997 and 2002, however, come from very different sources as cited earlier. The 1997 data is based on electricity consumption reporting whereas the 2002 data is based on electricity generation. DOER has carefully managed that data to produce the most compatible values. However, due to this incompatibility, DOER suggests that the analysis of the trend of existing renewable energy generation be founded on the basis of the percentage of supply, as opposed to the MWhs of supply.

- MSW plants are able to sell RECs into RPS markets in Maine and Connecticut Class II.

- Existing hydroelectric generation can sell RECs into the Maine and Connecticut Class II markets, and for generation offered by some suppliers to the National Grid GreenUp program.

- Existing biomass facilities can sell RECs in the Maine program. Their status for Connecticut Class I and II are not currently fully known to DOER. For the Massachusetts RPS program, the facilities can re-tool to meet advanced, low emission criteria, and receive RPS Certificates for generation above a historical average.

Current RPS Demand for Existing Renewable Energy in New England

Maine's RPS standard requires that 30% of supply comes from renewable energy generation. Based on 2002 EIA data[6], the total electricity retail sales to Maine customers is estimated to be 11,452 GWh, so the demand for renewable energy would be 3,436 GWh. Currently, the supply of eligible renewable energy is far greater than the RPS demand, and hence the value of RECs used to serve Maine's RPS is low.

Connecticut's RPS Class II standard is 3% (remains at this level throughout the program period) of total supply. Based on 2002 EIA data[7], Connecticut's total retail sale is 31,025 GWh, so that the Class II demand would be 931 GWh.

In total, the two New England RPS programs open to existing renewable energy creates a demand of 4,366 GWh. If an existing purchase requirement was put into effect in Massachusetts at the 8.0% level determined in 1997, the additional demand would be 3,718 GWh, based on the 2002 Massachusetts total supply of 46,475 GWh[8]. This program would increase the New England demand for existing renewable energy to 8,085 GWh.

Viability of a Massachusetts Minimum Purchase Requirement

The establishment of a minimum purchase requirement for Massachusetts electricity suppliers would establish a renewable energy certificate (REC) market for eligible existing renewable energy generation within the NEPOOL region and possibly imported generation. This market for the Massachusetts program would be essentially consistent with the current market for existing renewable energy certificates for the Maine and

[6] Electric Power Monthly, March 2003.
[7] Electric Power Monthly, March 2003.
[8] Supply for LDC load only, does not include municipal electric companies.

Connecticut Class II RPS programs, as well as some of the demand of the green power market.

As determined above, with an 8.0% Massachusetts minimum purchase requirement, the demand for existing renewable energy in New England would be 8,085 GWh. Also as determined above, the generation in New England of existing renewable energy in 2002 was 10,062 GWh. Therefore, the supply of existing renewable energy is still in significant excess of demand throughout New England. Even with a modest additional demand of a successful green power market, DOER calculates an excess market supply.

Under the Maine RPS program, the requirement for renewable energy purchase is far less than the supply of eligible generation which includes the class of existing renewable energy being studied. As a result, the market value for Maine RPS certificates is very low compared to the energy price and to the REC price for new renewable energy. According to Evolution Markets, the Maine RPS certificates were trading at $1/MWh[9]. The additional demand of a Massachusetts program is not sufficient to create a significantly tighter market, and therefore the market price for certificates would not change significantly.

A Massachusetts program would cause an increase and shift in the volume of RECs for existing renewable energy. The additional demand of the Massachusetts program of 3,718 GWh, multiplied by the REC price of $1/MWh, would suggest that approximately $3,718,000 would be added revenue to the existing renewable generators in New England. With Massachusetts responsible for about 29% of the existing renewable energy generation in the region, then $1,078,220 of the additional REC revenue might flow to Massachusetts generators (assuming no increase in imports). The remaining revenue would flow from within Massachusetts to outside the state.

The total revenue would emanate from the retail electricity suppliers in Massachusetts purchasing the RECs, which would be fully passed on to Massachusetts ratepayers. Importantly, due to the significant excess in supply, the revenue would not impact the ability of fiscally marginal existing renewable energy generators to remain in operation because the more fiscally sound generators could always offer to buy RECs at a lower price.

Hence the additional cost to ratepayers would not have an impact on the generation mix in New England, and hence not on our fuel diversity or emissions. The program would provide additional benefits (revenue) to the existing renewable energy industry, but without the public benefits sought. Hence, DOER does not consider the transfer of payments from ratepayers to existing renewable energy generators an effective policy in this case.

DOER also recognizes a significant administrative cost of implementing an existing renewable minimum purchase requirement, based on experience with the current RPS program. Administrative costs would be borne by DOER to develop, implement, and

[9] personal communication with Anna Giovinetto, Evolution Markets (September 26, 2003).

manage the program with limited resources currently dedicated to the success of the RPS program and increasing commitments to climate change and sustainable development initiatives. These programs are having critical impacts on the Commonwealth's future and returning important benefits. As suggested, the existing renewable minimum purchase requirement would have little impact on the energy sector.

Additionally, DOER recognizes that the RPS program has resulted in significant administrative costs on the retail electricity suppliers to engage in the NEPOOL GIS and REC market, and to meet RPS compliance. The sector has worked earnestly to learn and meet the RPS policy requirements. DOER would be concerned to burden the retail electricity suppliers with a new set of requirements for existing renewable energy purchases that would require additional administrative costs with little justification in terms of positive impacts to the energy sector or the Commonwealth.

APPENDIX A
NEW ENGLAND UTILITIES DATA SOURCES

SOURCES OF RENEWABLE ENERGY

Energy Sources are classified by two categories: (1) Generation Sources; and (2) Energy Purchases;
Total Renewable Energy by utility is the sum of total renewable energy purchased by each utility.

Energy Purchases

Most renewable plants are listed by utility and by state
Most renewable energy is hydroelectric by utility and by state.
Total Allocation of Renewable by utility and by state is the total of Renewable Energy Purchases.
DATA SOURCE: Power Purchases of the utility are in the FERC Form 1, page 326-327

SALES OF ENERGY

Sales are classified by 3 categories: (1) Ultimate Customers; (2) Requirement Contracts (RQ); and (3) Other.

Ultimate Customers:

Power sales to retail customers of each utility within a New England State.
Assumption: Renewables would go towards ultimate customers' demand.
DATA SOURCE: Sales to ultimate customers from the FERC Form 1, pages 401

Requirement Contracts (RQ):

These contracts are long-term contracts that directly tie the retail load to the utility.
Assumption: Renewables would go towards requirement contract demand
DATA SOURCE: Sales to ultimate customers from the FERC Form 1, pages 310-311

Other sales

These contracts are bilateral contracts and spot markets.
Sales are not tied to the utilities' decision of supply mix and future construction.
Assumption: Renewables were allocated to ultimate customers and requirement contracts first
DATA SOURCE: Sales to ultimate customers from the FERC Form 1, pages 310-311

Allocation of Losses and Renewables

Losses are calculated from apparent losses of sales to retail customers of each utility in New England.

Allocated Losses

Total Losses from Ultimate customers minus total Losses from RQ sales
Allocated supply of RQ sales minus RQ sales allocation
Assumption: In Every utility in NE, the Sum of Red & L T Losses is equal to 2.5 percent.

BASELINE CALCULATION WORKSHEET

Baseline Fraction

BASELINE
FRACTION

The baseline fraction of renewables sold to New England retail customers =

$$\frac{\text{NE retail renewable generation sold to NE customers - losses}}{\text{Base period sales to NE end users}}$$

APPENDIX B
TOTAL SALES TO NEW ENGLAND CUSTOMERS BY STATE AND ENTITY, 1997

State	Utility	Retail Electricity Sales (MWh)
CT	Connecticut Light & Power Co	21,223,098
	United Illuminating Co	5,389,088
ME	Bangor Hydro- Electric Co.	1,783,729
	Central Maine Power Co	9,173,880
NH	Granite State Electric Co	694,803
	Public Service Co of NH	6,458,353
VT	Central Vermont Pub Serv	2,134,004
	Green Mountain Power Corp	1,810,787
RI	Blackstone Valley Electric Co	1,292,755
	Narragansett Electric Co	4,833,260
MA	NSTAR-Boston Edison	13,246,124
	NSTAR-Cambridge Electric	1,288,760
	NSTAR-Commonwealth Electric	3,563,652
	MECO-Eastern Edison	2,644,269
	Fitchburg Gas & Electric	458,162
	Holyoke Water & Power	108,664
	MECO-Massachusetts Electric	16,163,997
	MECO-Nantucket Electric(2)	111,147
	New England Power(2)	7,560
	WMECO-Western Mass. Electric	3,701,761
NE	TOTAL UTILITIES IN SAMPLE	96,087,852
	Other Utilities	13,408,861
	TOTAL New England Sales	109,496,713

Source: FERC Form 1, EIA